Joint Strike Fighter

LOCKHEED MARTIN

F-35 JSF Global Sustainment

Luke Gill, VP
LM Aero

29 November 2004

Copyright 2004 by Lockheed Martin Corporation.

CURRENCY NOTICE: A hard copy of this document may not be the document currently in effect. The current version is always the version in the Lockheed Martin Network.

Distribution Statement A. Approved for public release: distribution is unlimited

11-29-0

JSF VISION

DELIVER AND SUSTAIN
THE MOST ADVANCED, AFFORDABLE
STRIKE FIGHTER AIRCRAFT
TO PROTECT
FUTURE GENERATIONS WORLDWIDE.

What is JSF ?

F-35A

F-35B

F-35C

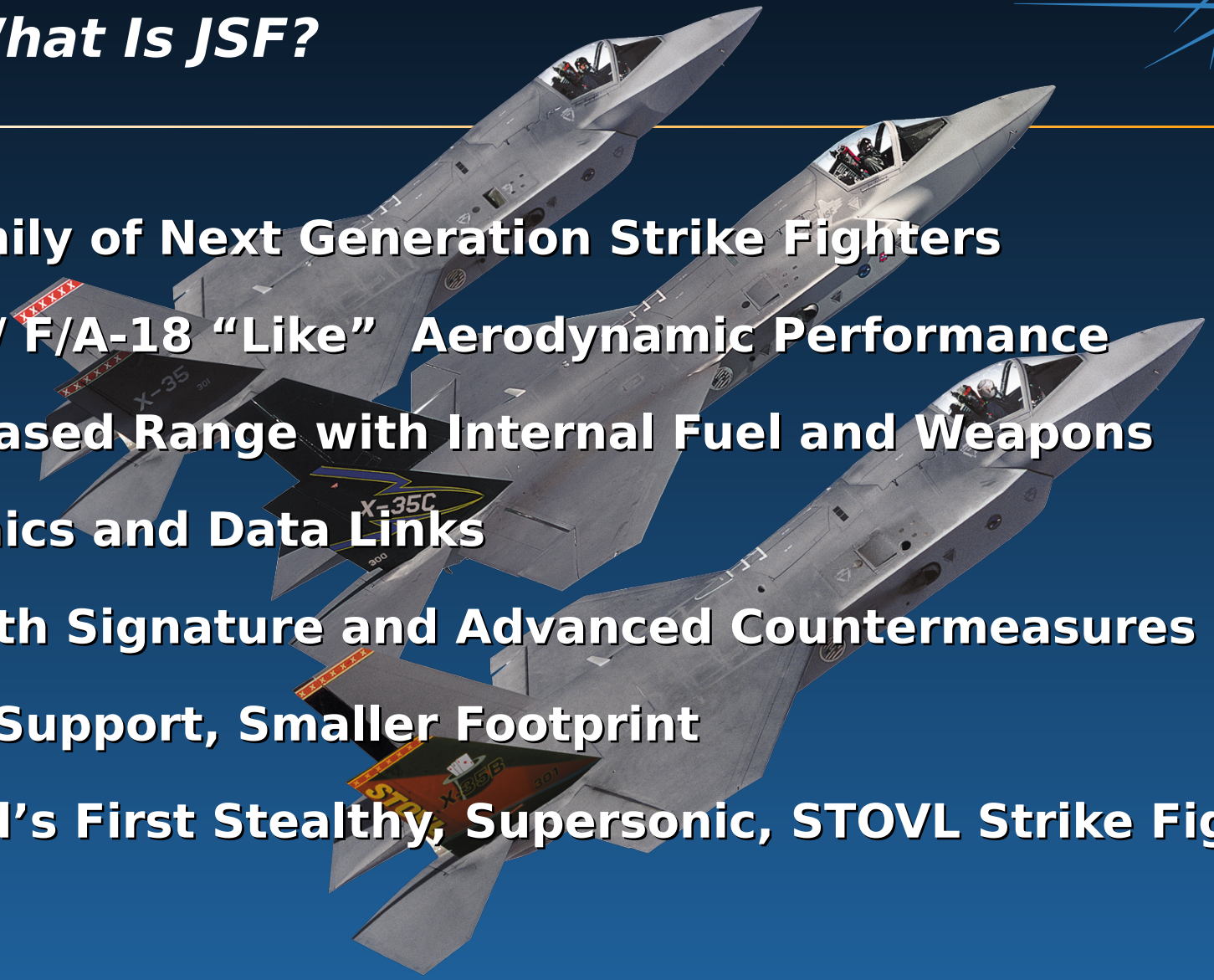
CTOL (USAF)

STOVL (USMC and UK)

CV (USN)

Distribution Statement A. Approved for public release: distribution is unlimited.

What Is JSF?



The Family of Next Generation Strike Fighters

- F-16 / F/A-18 “Like” Aerodynamic Performance
- Increased Range with Internal Fuel and Weapons
- Avionics and Data Links
- Stealth Signature and Advanced Countermeasures
- Less Support, Smaller Footprint
- World’s First Stealthy, Supersonic, STOVL Strike Fighter

Lethal Survivable Supportable Affordable

Distribution Statement A. Approved for public release: distribution is unlimited.

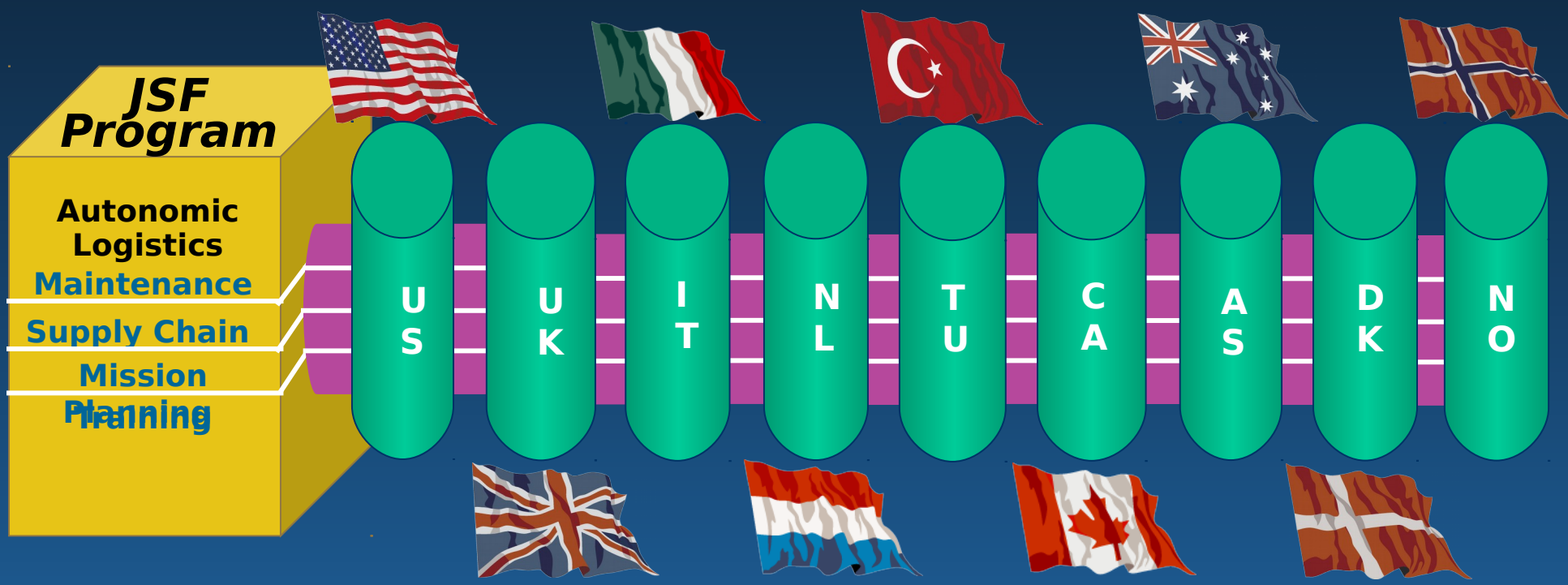
Service Needs

- **USAF**
  - *Multi-Role Fighter to Replace the F-16 and A-10 and to Complement the F/A-22*
- **USN**
  - *Multi-Role, Stealthy Strike Fighter to Complement the F/A-18E/F*
- **USMC**
  - *Multi-Role, STOVL Strike Fighter to Replace the AV-8B and F/A-18C/D*
- **UK (RN and RAF)**
  - *Supersonic STOVL Replacement for the Sea Harrier and GR-7*

2593 Aircraft Production Program of Record

Distribution Statement A. Approved for public release: distribution is unlimited.

Commonality Drives Affordability – Cross Service and International

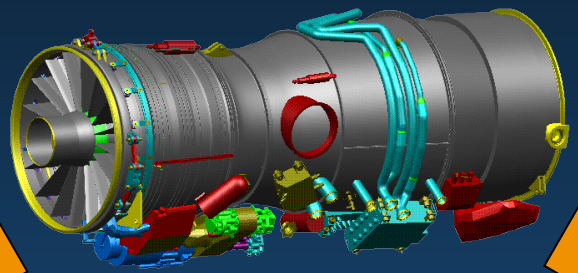


One Affordable Solution

Distribution Statement A. Approved for public release: distribution is unlimited.

Engine Interchangeability…

F135 or F136



CTOL

CV

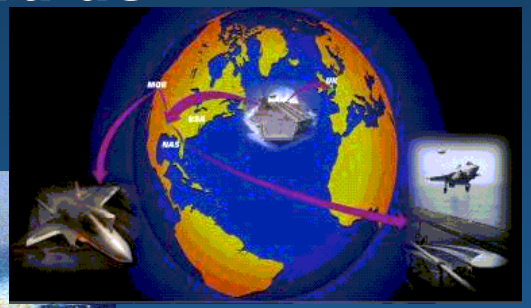
STOVL

Any Engine in Any Variant

Distribution Statement A. Approved for public release: distribution is unlimited.

The Autonomic Logistics Concept

- Optimized Supportability Decisions
- Agile / Scaleable Support
- Integrated Training
- ALIS-Integrated Infrastructure
- Partnering with Government and Industry for Best Value



A Global Evolution In Fighter Sustainment

Distribution Statement A. Approved for public release: distribution is unlimited.

AL is Prominent in KPPs and Requirements

Owner	Key Performance Parameter	USMC	USAF	USN	UK
Joint	Radio Frequency Signature	Very Low Observable			
Joint	Combat Radius	450 nm	590 nm	600 nm	450 nm
Joint	Sortie Generation (surge)	6.5 (4)	3.7 (3)	4.4 (3)	4.3 (3)
Joint	Logistics Footprint	4.6 (<8) C-17s	5.9 (<8) C-17s	109 (<243) ST	101 (<102) ST
Joint	Mission Reliability	99 (95) %	98.5 (93)%	98.6 (95)%	98.5 (95)%
Joint	Interoperability	Secure Voice and Data Connectivity			
USMC/UK	Vertical Lift Bring Back	2 x 1K JDAM + 2 x AIM 120 + fuel	N/A	N/A	2 x 1K JDAM + 2 x AIM 120 + fuel
USN	Maximum Approach Speed	N/A	N/A	145 knots	N/A

All Values Reflect 240-3 – As of 8 March 2004

Assessed (Requirement)

- *430 Total JCS Requirements*
  - *100 are AutoLog-related*
    - *65 are owned by AutoLog*
    - *35 are R&M requirements allocated to AV design teams*

Results in Integrated Sustainment

Distribution Statement A. Approved for public release: distribution is unlimited.

JSF Autonomic Logistics System

Highly Supportable Aircraft

- Smart / Reliable Design
- Prognostics and Health Management
- Remove and Replace (R/R) Maintenance
- On Condition Maintenance

Training System

- Integrated Training
- Embedded Pilot Training
- On Demand Maintenance Training
- Air Vehicle Software Reuse

Support System

- Sustaining Engineering
  - 24/7 Help Desk
- Electronic Joint-Service Tech Data
- Intelligent Maintenance Management
- Global Supply Chain Insight
- Support Equipment Management

Autonomic Logistics Information System

- Distributed Information System
- Enterprise Resource Solution
- Secure

Autonomic logistics targets O&S savings

Distribution Statement A. Approved for public release: distribution is unlimited.

Prognostics Health Management

PMD

Air Vehicle PHM

- Enhanced diagnostics / BIT
- Corroboration
- Correlation
- Information Fusion
- Health Management Reports

Downlink

PMA

MM: PMA

Fleet Mngt Activities

Customer Support

Autonomic Logistics Information System

- Decision Support
- Autonomic Process
- Integration

Unit Level Maintenance

Off Board PHM

- Prognosis Models
- Life Usage Algorithms
- Failure Resolution Algorithms
- Diagnostic Tools

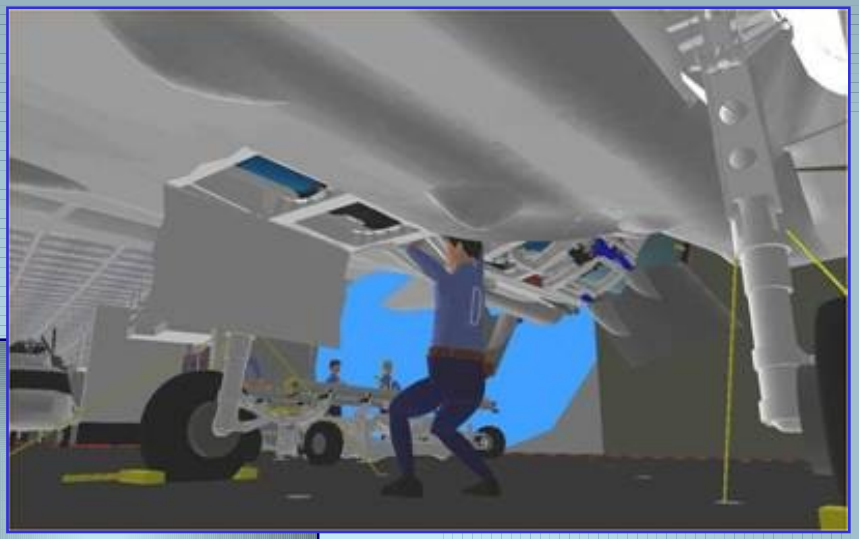
Suppliers and

Distribution Statement A. Approved for public release; distribution is unlimited.

Remove and Replace Aircraft Maintenance Concept

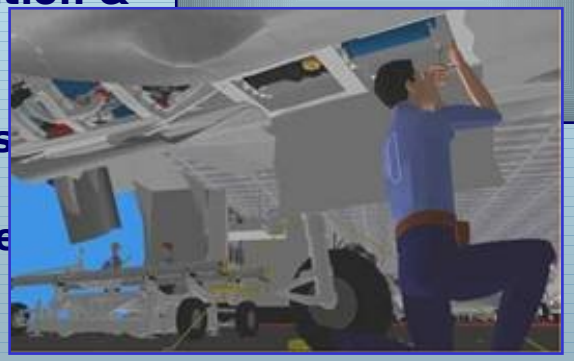
APPROACH

- Unit Level (On/Off Equipment) & Depot
- On Equipment – R/R and Servicing
  - Aircraft Handling / Weapons Loading
- Off-Equipment
  - Seat, Tire & Wheel, etc.
- OEM/ Organic Depot Repair of Repairables
- Three Maintenance Task Groups



CHARACTERISTICS

- High Reliability with Robust Prognostics, Health, Management (PHM)
- PHM Provides Failure Prediction & Estimated Remaining Life
- Ground Level Maintenance
- Quick Access Doors & Panels
- Self Sufficient – Integrated Power Package (IPP) Provide Ground Power & Cooling

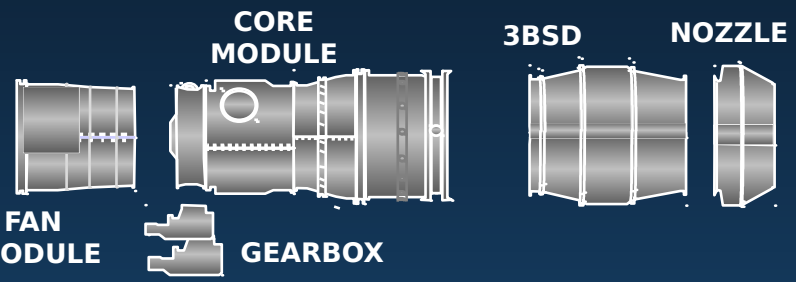


BENEFITS

- PHM Reduces Troubleshooting and Scheduled Maintenance
- 71% Reduction in Maintenance Man Hours
- No LO Restoration for 99% of Maintenance
- 25% Improvement in SGR
- 95% of LRCs are Single-Tiered for R&R
- Reduced Log Footprint

Distribution Statement A. Approved for public release: distribution is unlimited.

Engine Maintenance Concept



Unit Level (On-Equipment Maintenance)

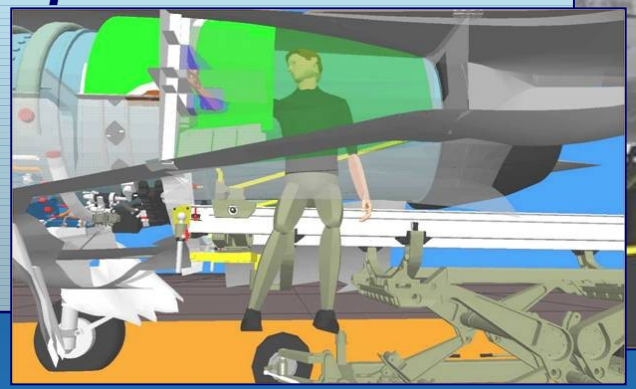
- Engine R&R within Maintenance Box
- Engine LRC R&R
- Lift Fan R&R
- Inspections/Servicing/Repair
- No High Power Engine Run Required
- No Sched JOAP Requirements

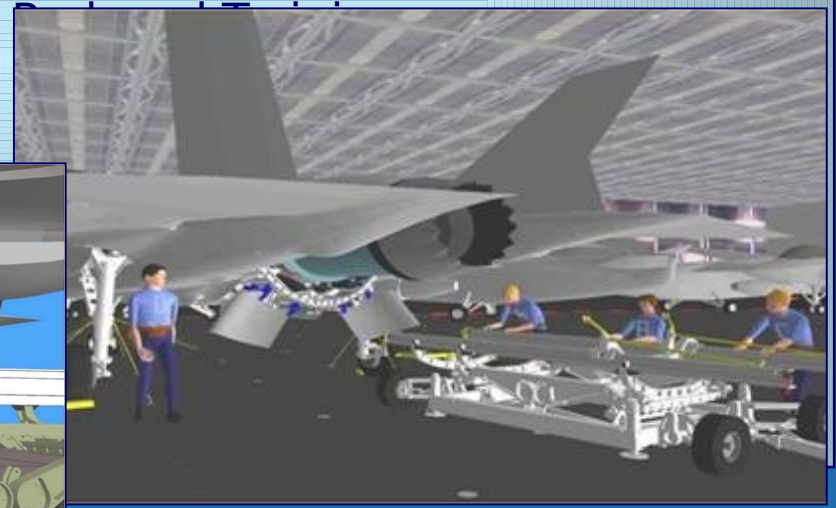
Unit Level (Off-Equipment Maintenance)

- Module R&R
- Repair in Place
- Hardware R&R

No I-Level Engine Shop Required:

- No Test Cell or Uninstalled Engine Runs
- Reduced Engine Spares
- Reduced Manpower
- Reduced SE
- [illegible]





Distribution Statement A. Approved for public release: distribution is unlimited.

Autonomic Logistics Information System

ALIS consists of the system, application and network infrastructures required to provide global integrated and autonomic support

- ***Single, Secure Information Environment***
- ***Distributed Network Based on Web Technologies***
- ***Capabilities Integrate Broad Range of Domains***
  - Operations
  - Maintenance
  - Supply Chain
  - Customer Support Services
  - Training
  - Tech Data
  - External Interfaces

Functionality Focused on Enhancing Operations and Support

- Decision Support
- Autonomic Process Integration

Theater Level
Immediate Air Asset Allocation

Wing Level
Mission Support Rqmts

Squadron Level
Maintenance & Support Resource Allocation

"Provide All Information To Support Operations and Maintenance at Any Basing Location"

Distribution Statement A: Approved for public release; distribution is unlimited.

Supply Chain Management Infrastructure

Warfighter

ALIS

Autonomic Logistics Operations

JSF Industry Team

Sources of Repair / Supply

Local Supply

Commercial Transportation and Warehousing

Forward Distribution Point

SE, Weapons, Fuel

ALIS

Supply Services Provider

Govt Transportation Service

Distribution Statement A. Approved for public release: distribution is unlimited.

JSF Training
Virtual – Constructive - Live

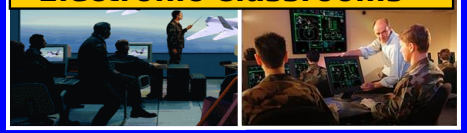
Pilot Entry Criteria
- T-38
- T-45
- Fighter Qualified

Maintainers Entry Criteria
- A School
- Tech School
- Previously Qualified Tech

Integrated Training Center

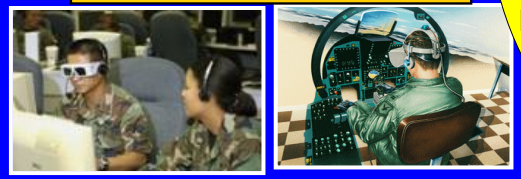
- Flying Syllabus
- Advanced Simulation Systems
- Interactive Multimedia Instruction
- Electronically Mediated Lecture

Electronic Classrooms



Computer Resource Centers

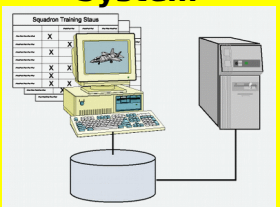
Advanced Simulation



Service Training Squadrons

- Service Unique Training
- Tactics/Weapons
- Embedded Training

Training Infrastructure System



Distributed Management
Records, Courseware, Software, Tech Data, Configurations

Operational and Deployed

- Pilot Mission Rehearsal
- Maintainer Task Rehearsal
- Distributed Mission Training
- Web Based on Demand CBT
- Continuation Training
- Embedded Training

Deployed/On Demand Training
- Deployable Mission Rehearsal Trainer
- Distributed Learning
- Full Access to All JSF Courseware

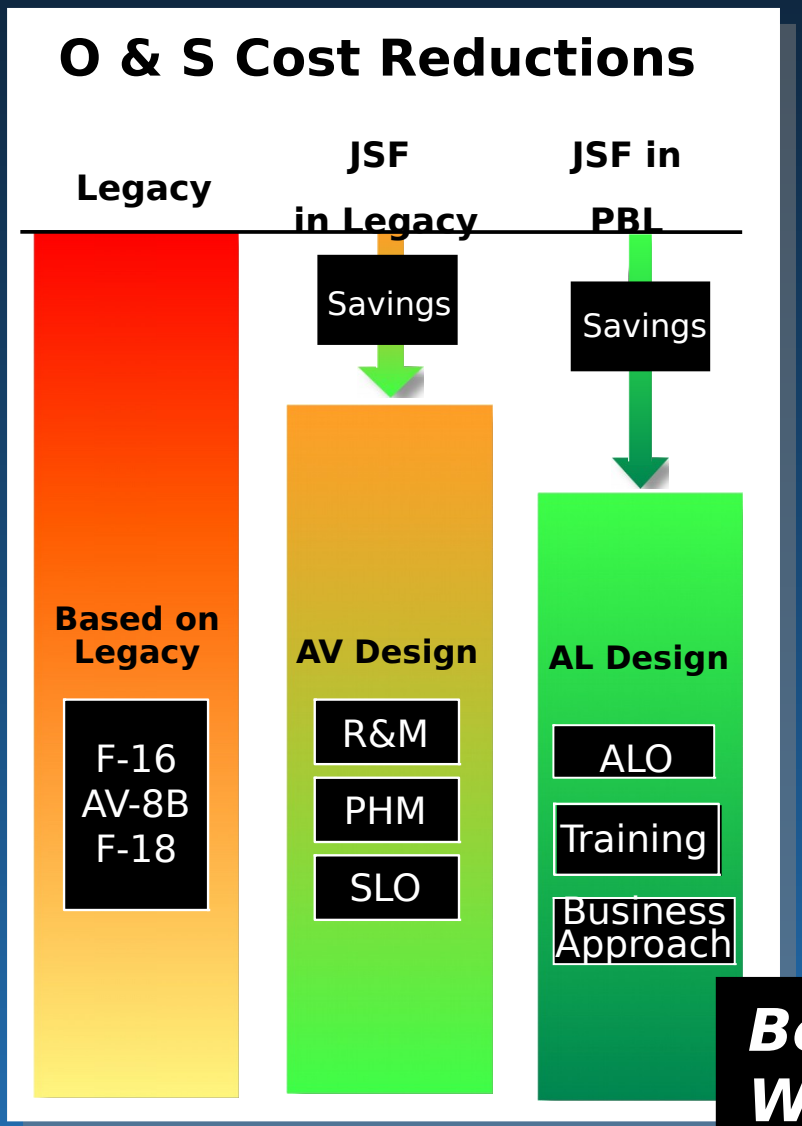
ALIS Connectivity

Feedback

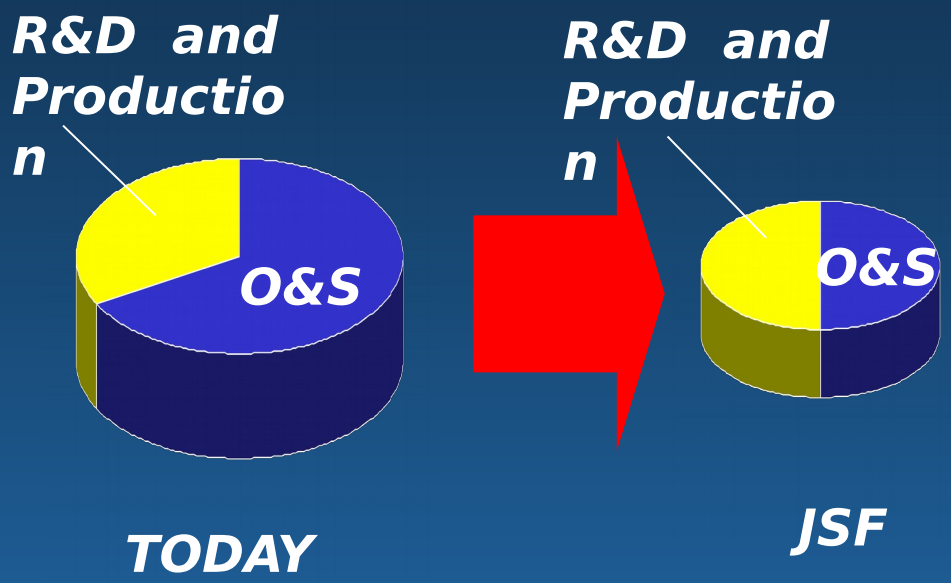
Distribution Statement A. Approved for public release: distribution is unlimited.

Autonomic Logistics Objectives

O & S Cost Reductions



The Affordability Challenge



Best Value Solution meets Warfighter Needs at Lowest Cost of

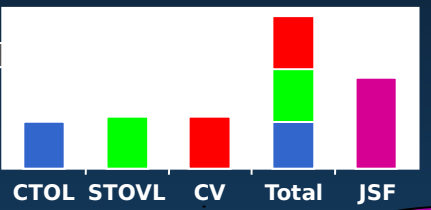
Distribution Statement A. Approved for public release; distribution is unlimited.

Affordability – Total Ownership Cost Reduction

KPPs

Owner	Key Performance Parameter	USMC	USAF	USN	UK
Joint	Radio Frequency Signature	Very Low Observable			
Joint	Combat Radius	450 nm	590 nm	600 nm	450 nm
Joint	Sortie Generation (surge)	6.5 (4)	3.7 (3)	4.4 (3)	4.3 (3)
Joint	Logistics Footprint	4.6 (<8) C-17s	5.9 (<8) C-17s	109 (<243) ST	101 (<102) ST
Joint	Mission Reliability	99 (95) %	98.5 (93)%	98.6 (95)%	98.5 (95)%
Joint	Interoperability	Secure Voice and Data Connectivity			
USMC/UK	Vertical Lift Bring Back	2 x 1K JDAM + 2 x AIM 120 + fuel	N/A	N/A	2 x 1K JDAM + 2 x AIM 120 + fuel
USN	Maximum Approach Speed	N/A	N/A	145 knots	N/A

SDD



Airframe: 80-90% Common or Cousin Parts

Avionics System ~100% Common

Commonality Is Key to Affordability in SDD, URF, O&S

Performance and Price Based Contract

Drive Desired Behaviors

Design AV to Minimize Resource Demands

Sustainment

AL Operations

Joint Training

ALIS

Support

Design Autolog to Sense & Respond

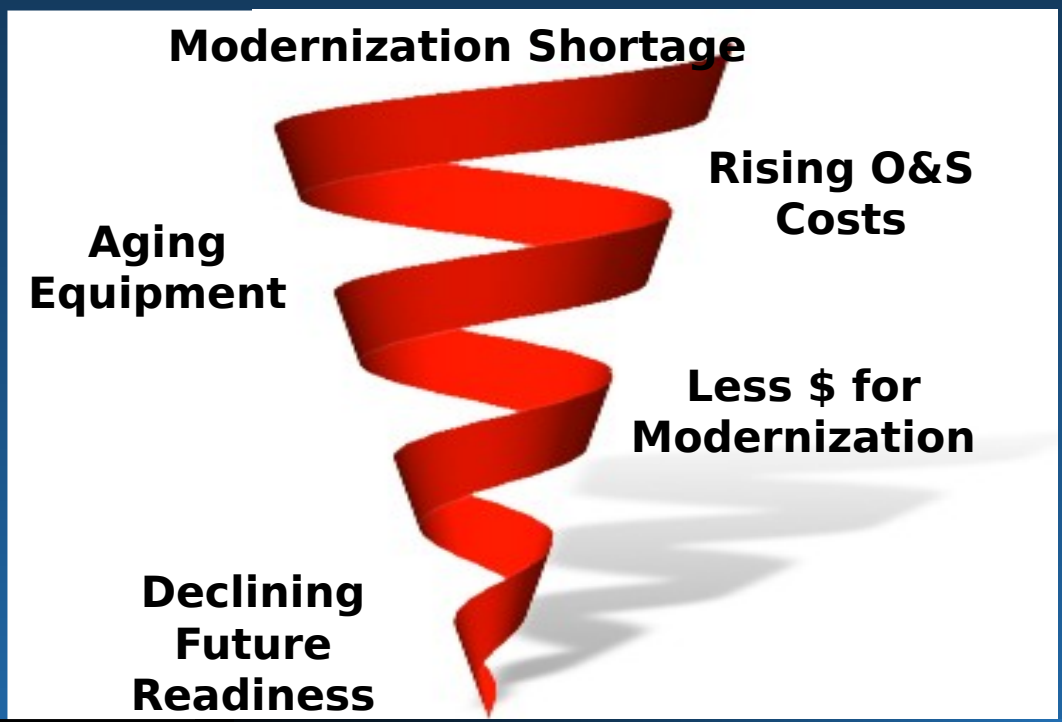
Reduced Total Ownership Costs

Distribution Statement A. Approved for public release: distribution is unlimited.

The O&S "Death Spiral"

THE PROBLEM:

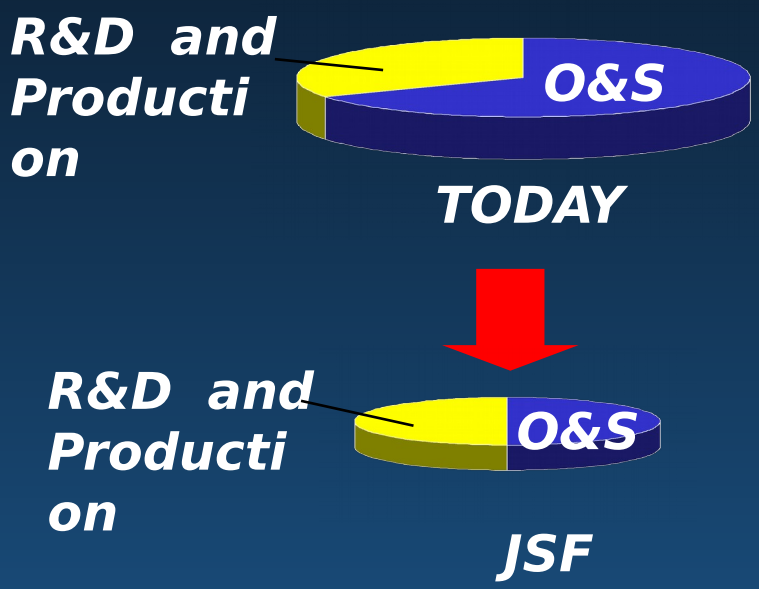
- O&S Costs Rising at 10-14%/Year
- Budgets Not Keeping Pace with Requirements
- Results: Readiness Declining and Reduced $ $ for Modernization

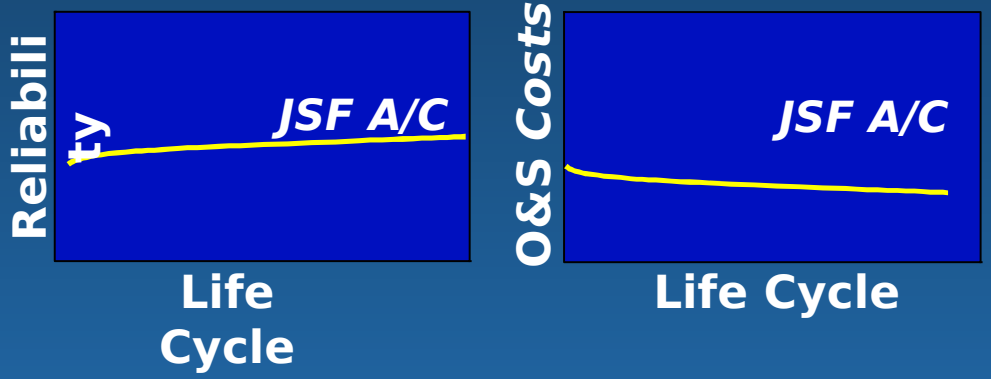


The Crux of Dr. Gansler's "Death Spiral"

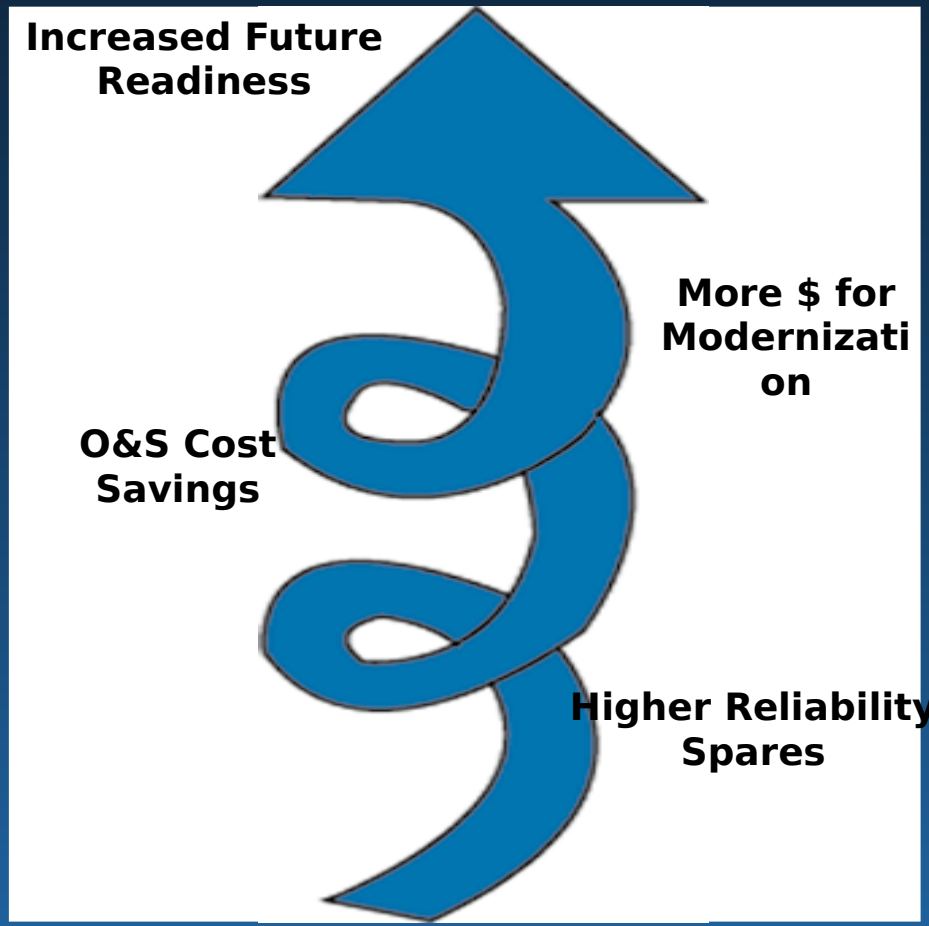
Distribution Statement A. Approved for public release: distribution is unlimited.

The Promise of JSF





The Vital Spiral



The Question is "How do you do it?"

Distribution Statement A. Approved for public release: distribution is unlimited.

PBL Emphasis

- **QDR (2001):** "**DoD will implement Performance-Based Logistics** to compress the supply chain and improve readiness…"
- **DoDD 5000.1; DoDI 5000.2 (12 May 2003)**: "**PBL is the preferred support strategy** within the Department of Defense whenever practical, and PMs are to work directly with users…"
- **Wynn Memo, Jan 04: Provided BCA guidance for PBL programs**
- **Wolfowitz Memo, Feb 04: Directed USD(AT&L) to issue clear guidance on purchasing using performance criteria**. Also directed Services to provide plan to aggressively implement PBL
- **MID 917: Identifies JSF as a potential PBL pilot program** and requires BCA within 180 days of MID 917 signature

Distribution Statement A. Approved for public release: distribution is unlimited.

Contracting Strategy

End-State (2014 –)

LRIP I – LRIP VI (2008 – 2013)

Contracting Strategy

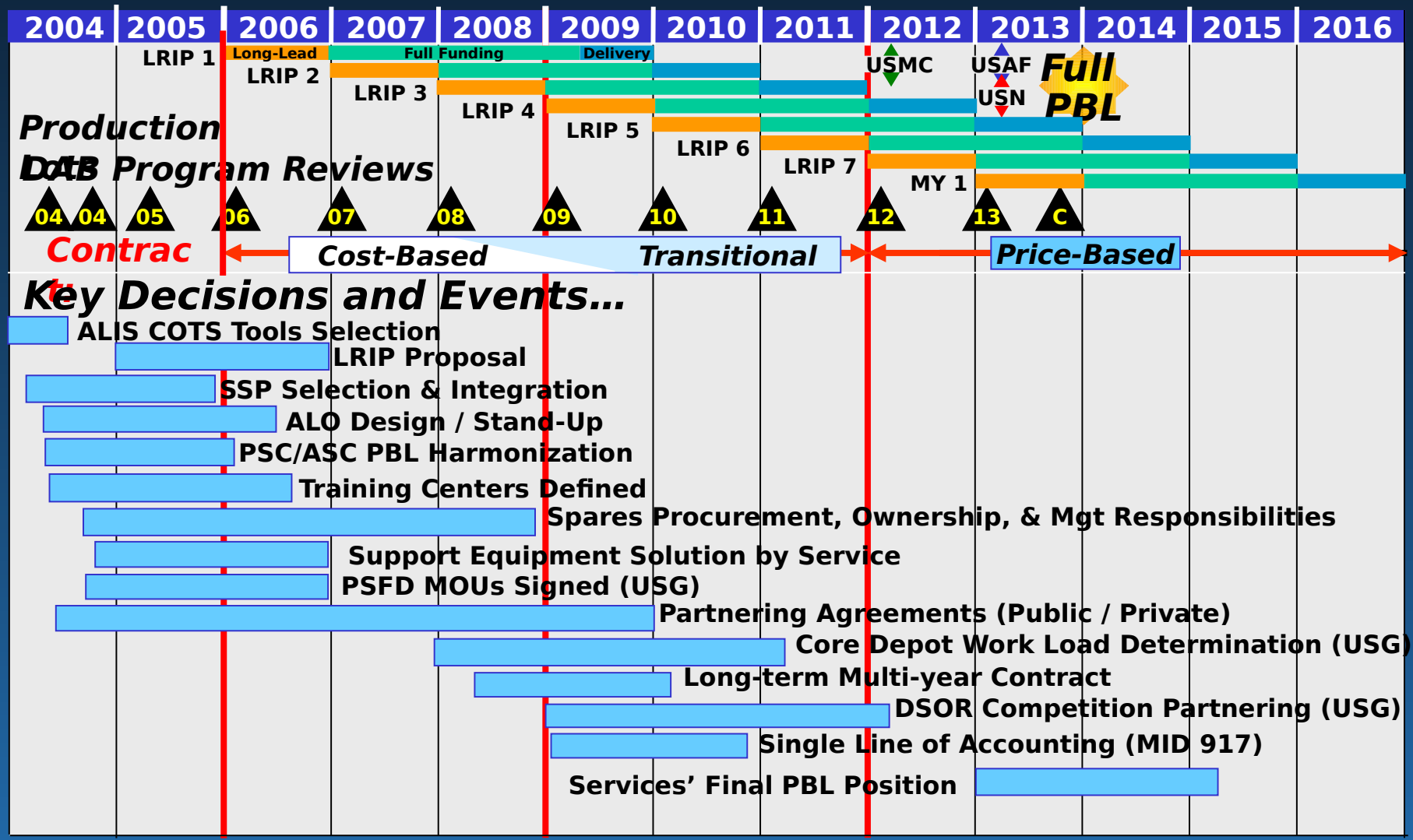
- Six Annual Contracts
- Initially Cost Reimbursable, Transitioning to Fixed-Price Incentive
- Brings On End-State Terms Incrementally
- Provide the Government and the Contractors the Data Required to Implement the End State Terms

Contracting Strategy

- Eight Year Multi-Year O&M Service Contract
- Revisit After Three Years
- Priced-Based Contracts For Life of Program
- Usage, Not Breakage Algorithm
- Significant Savings

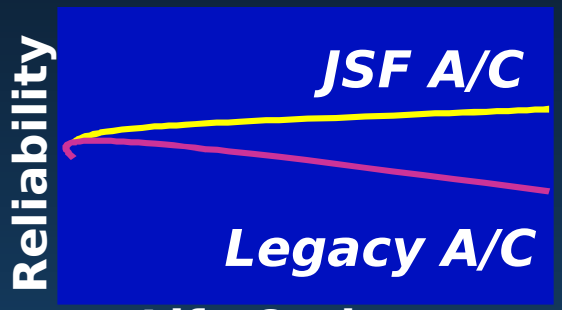
Distribution Statement A. Approved for public release: distribution is unlimited.

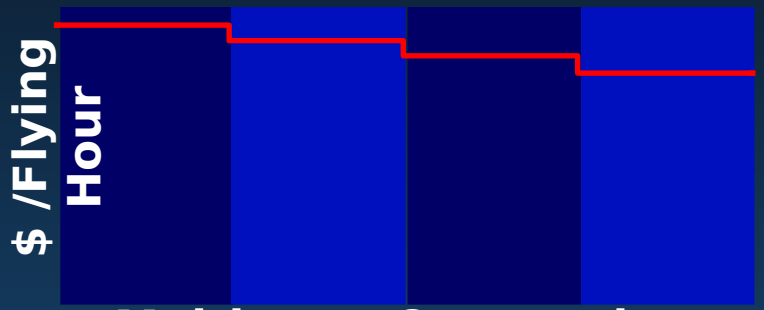
F-35 Logistics Roadmap to PBL

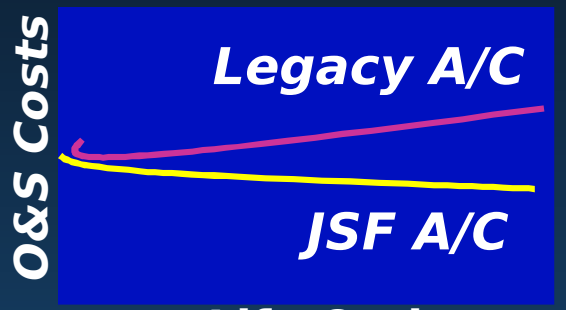


Distribution Statement A. Approved for public release: distribution is unlimited.

Key Elements of F-35 PBL







Continued Reliability Improvements

Air System Benefits

Continued Performance Improvement at Lower LCC

Decreasing O&S Costs

Programmatic Benefits

- **AWARD-TERM CONTRACT: PROVIDES DoD "OFF RAMP"**
- **"Power By The Hour" Concept – Fixed revenue per flight hour**
- **Continuous cost reductions only method to achieve commercial profitability**
- **Incentives/penalties flowed to all teammates – including DoD Depots & ICPs**
- **Comprehensive support per flight hour cost periodically reduced based on learning curve & actuals**
- **Improved component reliability & depot turn-around times perpetually incentivized – only means to enhance profit is through cost reductions**

Distribution Statement A. Approved for public release: distribution is unlimited.

Challenges

- **Multi-Year Performance-Based Support Contract**
  - ***Long-Term Horizon To Facilitate Investment***
- **Monthly Payments Based on Usage Versus Breakage**
  - ***Constant Revenue Stream to Contractor Team***
- **Fixed Price Contract in Sustainment**
  - ***$/Flying Hour (FH) Basis***
- **Advanced Down Payment**
  - ***Additive to URF for Infrastructure and Spares***
- **Price Improvement Curve**
  - ***50/50 Gain sharing of Cost Reductions With Government***
- **Spares Ownership Buy-Back Plan**
  - ***One-Time Title Transfer With Payment via Credits on $/FH***

Distribution Statement A. Approved for public release: distribution is unlimited.

Summary

- **Large Production Base for Lowest Cost**
- **Most Advanced Technologies**
  - ***Stealth, Performance, Advanced Weapon Systems***
- **Unprecedented Access, Range, Persistence**
- **High Tempo / Combat Power Generated**
- **Reduced Ownership Costs**
  - ***High Reliability, Increased Sortie Generation, Lower Manning and Innovative Contractor Support***
- **Agile Support**
  - ***Integrated Electronic Training of Pilots and Maintainers***
  - ***ALIS-Integrated Infrastructure***
  - ***Partnering with Government and Industry for Best Value***

Distribution Statement A. Approved for public release: distribution is unlimited.

Questions?